



## Petition to Delist Tritiated Mixed Waste Treatment Residues

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### 1. Background Information about the NTLF

Berkeley Lab's National Tritium Labelling Facility (NTLF) was established as a National Institutes of Health national resource center in 1982. The facility's role is to conduct tritium labeling research, to help biomedical researchers label materials with tritium, and to supply crucial assistance in the development of new products that are essential in the understanding, treatment and cure of disease. When facility staff and visiting researchers "label" pharmaceuticals and other materials, they replace hydrogen atoms with tritium atoms (*i.e.* radioactive hydrogens), so that the behavior of the labeled materials can be easily distinguished, traced and measured in biological systems.

### 2. The LBNL Delisting Petition

#### Treatment and Disposal of Mixed Waste

During NTLF labeling and research experiments, small quantities of liquid solvents come into contact with tritium. When disposed, solvent byproducts such as those listed in Table 2-1 of the Delisting Petition are classified by the U.S. Environmental Protection Agency (EPA) as "mixed waste" because they include both radioactive and regulated hazardous chemical wastes. Mixed waste management is complex because there are separate regulations for hazardous waste and radioactive waste.

The hazardous waste regulations require treatment to remove or minimize hazardous chemical characteristics and constituents in the NTLF mixed wastes before they are disposed of to the land.

The currently available method for such treatment of NTLF mixed wastes is incineration. However, incineration of NTLF mixed waste would release the radioactivity in the waste directly into the environment, without the benefit of engineering controls we use to minimize such releases. In 1996, Berkeley Lab began a treatability study to consider alternative methods for treating tritiated mixed waste, as allowed by the hazardous waste regulations. The Lab has been testing a method in which the hazardous

chemical constituents are destroyed through catalytic chemical oxidation (CCO), leaving radioactivity as the only remaining hazard. Although it would seem appropriate to dispose of these tritium-containing residues at a low-level radioactive waste disposal site, the hazardous waste regulations dictate that the residues remain mixed waste until formally "delisted" by EPA.

As a result, disposal options for these mixed waste residues are limited. Low-level radioactive waste disposal sites are not licensed to handle mixed wastes. Sites permitted for mixed waste disposal cannot accept the level of radioactivity that is contained in the NTLF mixed waste treatment residues.

To complete the treatment and disposal cycle, on June 30, 1999, Berkeley Lab submitted a petition to EPA to delist the treatment residues and therefore exempt them from hazardous waste regulation. This would open options for disposal of the residues in a low-level radioactive waste landfill, or allow for tritium recycling.

#### The Treatment Process

LBNL researchers have demonstrated that the catalytic chemical oxidation process is successful in destroying the hazardous chemical constituents of the NTLF tritiated mixed waste. The process involves using high temperatures to decompose organic chemicals in the presence of a catalyst and oxygen. Before oxidation, NTLF mixed wastes contain organic compounds listed or otherwise regulated by the EPA as hazardous. After oxidation, the treatment residues consist of 1) the oxidized and condensed product (water containing tritium) and 2) tritiated water stabilized on silica gel. The residues contain no hazardous waste characteristics, contain no detectable levels of the hazardous chemical constituents for which a listing of the waste was originally required, and meet applicable treatment standards for underlying hazardous constituents.

The delisting petition also includes an application for approval of the catalytic oxidation process as an acceptable method for



treating the NTLF wastes to meet EPA land disposal requirements.

Catalytic chemical oxidation has been shown to meet EPA requirements for the destruction of regulated hazardous compounds with the same efficiency as incineration. A benefit of the CCO approach is that it avoids the emission of tritium to the environment which would result from incineration.

### Potential Benefits

The U.S. biomedical research community, including academia, faces extremely limited treatment and disposal options for many of the mixed wastes generated by their activities, particularly for tritiated mixed waste. These problems also exist for the pharmaceutical industry, where isotopes such as tritium and carbon-14 are regularly used. Therefore, Berkeley Lab believes that it is essential to demonstrate processes for ensuring that mixed waste, especially tritiated mixed waste similar to that generated by the NTLF, may be treated and disposed of in a manner that minimizes impacts to the environment.

Berkeley Lab's catalytic chemical oxidation process offers an environmentally benign alternative to incineration, and a delisting of the residues of this process will provide a viable disposal or recycling route. For other institutions, this could lead to reduction of the amount of mixed waste in local storage, and a new mechanism to invigorate waste minimization and tritium recovery. Some U.S.

scientific and manufacturing sectors engaged in medical and pharmaceutical research using radioisotopes have greatly decreased their activities because of unresolved mixed waste issues. Such beneficial research could be rejuvenated. The treatment process could also present a commercial opportunity in the field of non-incineration waste treatment technology or tritium recycling.

### 3. Procedure for Delisting

The Laboratory has prepared and submitted a petition to delist its catalytic chemical oxidation treatment residues, which are currently regulated based on the so-called "derived-from" rule in U.S. EPA regulations. The delisting would exempt the residues from hazardous waste regulation.

The EPA provides a mechanism for technical evaluation of the petition and public review and comment. The submittal is noticed in local newspapers, and the full Petition to Delist Tritiated Mixed Waste Treatment Residues, with appendix material, is also available *via* the Berkeley Lab website, at:

[www.lbl.gov/LBL-Programs/tritium/delisting/](http://www.lbl.gov/LBL-Programs/tritium/delisting/)

After the EPA completes its review, a notice will be published in the Federal Register, and this is expected within 6 – 9 months. A public meeting will be held to discuss the delisting petition before the EPA makes a final decision.

### For more information the following contacts are available:

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